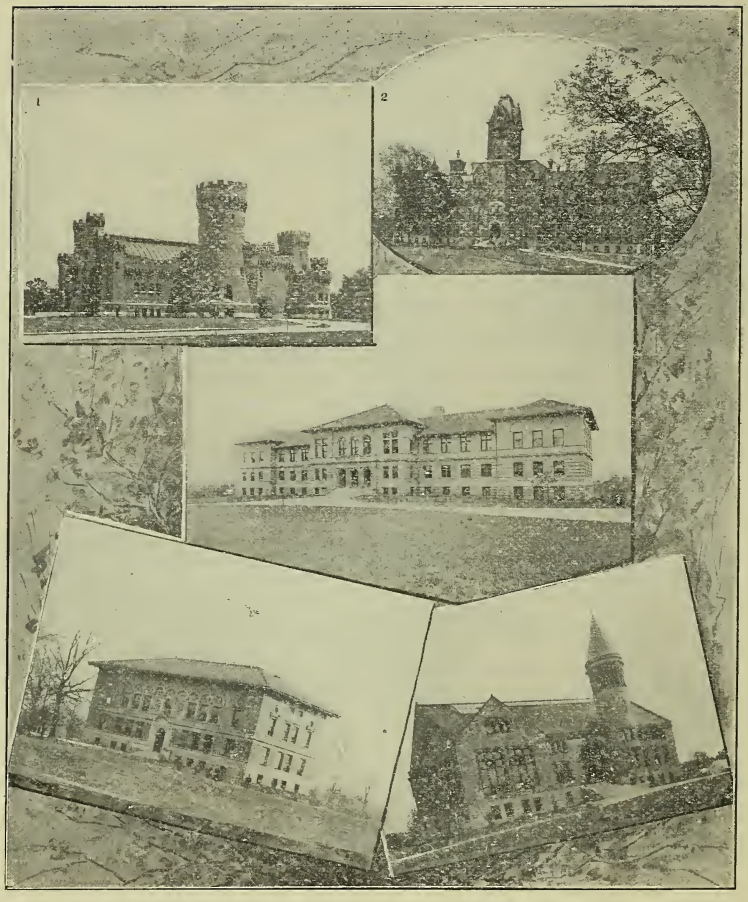

Gymnasium. Townshend Hall. Main Building.

Biological Hall. Orton Hall.

THE AGRICULTURAL STUDENT.

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EDITORIAL CHAT.

The Maintenance of Fertility is the subject of Bulletin 110 of the Ohio Experiment Station, and deserves the especial attention of every farmer. It is perhaps one of the most interesting and complete bulletins ever issued by the Station. The investigations reported have been conducted upon the plans adopted at the conference of experiment station workers, held in Washington, D. C., in 1888. The bulletin was compiled by Director Thorne, and gives the results of field experiments at the Station and at other places in Ohio, from 1888 to 1899. It also contains numerous illustrations from scenes about the Station. The bulletins of the Station are free to all who will send their address. Those who neglect to do so cannot know the amount of valuable information they are missing.

Last year, at the Commencement meeting of the Committee on College Affairs, of the Alumni Association, it was determined to make a thorough study of the conditions of every college in the University; the object being to learn of the most urgent needs of each department. In accordance with these plans two sets of questions have been sent to each member of the Senior Class, one referring to the department in which they will graduate, and the other to the University in general. By this method it is hoped to bring out the strong and weak points in the equipment and instruction in each department and in the University. In this way the Association will be able to present to the Trustees of the University the most urgent needs of the institution. The Association is the only medium between the students and the Trustees. It often happens that an instructor obtains a position and is retained when he is really a positive hindrance to the students under him, simply because the Trustees can not know of the efficiency of the detailed work in the class room. By the facts gathered from the entire Senior Class and from other sources, the Trustees will have presented to them in a clear and definite way the deficiencies in instruction and equipment, and will be enabled to act intelligently on such matters. This effort to advance the internal growth and development of the University is indeed a commendable one.

The Heywood bill, providing for an increase of the levy for the needs of the University making available to the University $180,000 to be immediately available for building purposes, passed the House last week with only two dissenting votes. The proper committee in the Senate recommended the bill to that branch of the Assembly, March 26th, and there is little doubt but that it will pass.

The University will thus have placed at its disposal the above sum for the construction of a new law building and a new physics building. The need of these buildings has long been felt, and every friend of the University will be glad to know that they are about to be a reality. Work will probably begin on them early in the summer and before another year ends these respective departments expect to be in a home of their own.

Farmers' Unions.

The Garland Farmers' Union is the title of a neat and attractive catalogue just received, published by the Union under the direction of Marley R. Shellabarger, a graduate in agriculture in the class of '97. After graduation Mr. Shellabarger returned to his home and is there doing an excellent work among his fellow farmers. He has been an active leader in the work of the above Union, which is accomplishing so much to help the members to obtain many of the pleasures of farm life before missed. The following quotation from the introduction admirably states the object of the Union, and the catalogue itself may be taken as some indication of the results: "Much of the lack of progress in agricultural industry is due to the isolated life the farmers have heretofore led, which shut them off from personal contact with the most progressive and successful men of their profession, as well as from intercourse with wide-awake and advanced thinkers in other occupations. A well organized farmers' club, properly conducted, in a degree remedies this serious evil, and soon interests a whole community in the general welfare, and relieves the monotony of the old isolated farm life, by introducing the delightful and profitable pleasures of social entertainment and intelligent discussion."

The catalogue contains the constitution and by-laws of the Union, a list of the books and bulletins available to the members—a very complete and extensive one, covering nearly every phase of farm work. We cannot fail to mention the excellent article on the University and its work for the farmers. It is a splendid sign to see the University constantly held up before the rising generation of farmers' boys and girls as a possibility within their reach.

That the local merchants are interested in the Union is evidenced by their willingness to advertise in the catalogue. Only reliable firms are advertised and the members give them their preference in their transactions, so that both parties are benefited. The success of the Garland Farmers' Union should be suggestive to those students of agriculture who return to the farm. There is here a large field for usefulness.

Free Distribution of Sorghum Seed.

More than three thousand requests for sorghum seed have been received by the Ohio Experiment Station, in response to its announcement of free distribution of improved seed, furnished by the National Department of Agriculture for the purpose. This large demand was altogether unexpected, as a similar announcement made a year ago, brought only 122 applications for seed. Since the supply of seed furnished by the Government, though very liberal, is altogether inadequate to furnish a sufficient quantity of seed to each of so many applicants for a satisfactory test, the Experiment Station has purchased a large additional quantity of seed from the same person in Kansas who furnishes the Government supply, and this will be added to the free distribution.

This is done from a desire not to disappoint those who are expecting seed from the Station and in belief that this seed, which has been carefully bred for

ten years past, under the direct supervision of the Chemical Division of the National Department of Agriculture, will be the means of effecting a direct improvement in the sorghum crop of Ohio.

Even with this additional quantity of seed it will be impossible to send more than half a pound of seed to each applicant, but this will be sufficient for a fair test of the new varieties and will enable the farmers of the state to raise sufficient seed for next season's planting.

The seed will be sent out in April, in ample time for planting, as sorghum should not be planted in this latitude before the last of April or first of May. It grows so extremely slow at first, especially in cool weather, that it will require extra labor to keep the weeds down if it is planted before the ground is reasonably warm.

A bulletin is in course of preparation which will give full directions concerning the culture and management of sorghum, which will be sent to all who receive seed and to such others as may apply for it.—Press Bulletin, Ohio Experiment Station.

Census of Pure-Bred Live Stock.

An enumeration of the pure-blood or pure-bred farm animals in the United States will be a part of the twelfth census. The main schedule for agriculture provides for returning "the number, June 1, 1900, of all pure-blooded animals recorded or eligible to record, on the farm."

While the Treasury Department, in administering the tariff laws relative to pure-bred animals, does not accept the verbal statements of owners or agents, but requires certified evidence in writing of the pedigree claimed, the census enumerator will be compelled to rely pretty generally, if not wholly, upon verbal replies as to whether stock is pure-bred.

The Customs Divisions of the Federal Government recognizes the certificates of the publishers of about eighty American and perhaps seventy-eight English, German, French, Belgian, Russian, Spanish, Pomeranian, East and West Prussian, Netherlands, Friesland, Swiss, New Zealand, and Algerian herdbooks. The Census Office will, of course, recognize the validity of the same registers.

As several months must elapse before the census of livestock will be taken, Director Merriam requests that all who are not certain whether their unregistered animals are grade, or pure-bred and "eligible to record," take steps definitely to settle the mooted point, and thus be prepared without hesitation to give the enumerator accurate information relative to this interesting inquiry.

Sheep may be recorded by flocks; but other animals are recorded by individuals. The herdbooks show that about 750,000 cattle have been registered in the United States and it is estimated that about 350,000 are living. If breeders will make accurate returns of their pure-bred animals to the census enumerators next June, a correct basis will be secured for showing future expansion in high-grade livestock. Otherwise the efforts of the census officers will be of small value. "A word to the wise is sufficient," says Director Merriam.

The Dairy School.

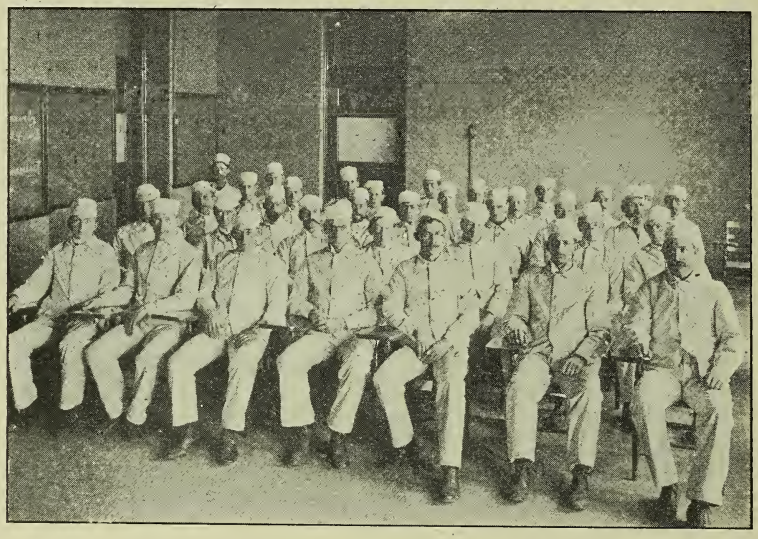
The winter term in dairying closed Saturday, March 17, after one of the most satisfactory sessions of its history.

The interest on the part of the students, and the quality of the work was never better. Never before has there been such an interest manifest in the school on the part of the dairymen and creamerymen of the country. No previous class has ever been so successful in securing good positions, and the supply of men is scarcely equal to the de-

mand. While some in the class were permanently located before entering the schools, by far the larger number obtained their positions through Professor Decker. While some of the men have no position as yet, they all have had a position under consideration, and will probably obtain one as a result of their work in the Dairy School. The following is a list of the names of some of the students and where they are at:

G. W. Cotton has charge of James Devol's Milk Bottling Plant at Marietta, O.; Elmer E. Thomas will assist his brother in the management of a farm dairy near Newark, O.; M. E. Miller is second man in a creamery at Dodgeville, Ashland County, O.; J. J. Ladrach will operate his father's factory at Burmingham, O.; Allen Shepard will operate a skimming station at North Ridgeville, Lorain County, O.; R. Oswold is first man in a creamery at Aurora, O.; C. C. Kenney is second man at Aurora, O.; N. H. Carey is operating a milk bottling plant at New Buffalo, O.; W. E. Evert, creamery, at Brownsville, O.; J. W. Ewert, farm dairy at Magadore, Summit County, O.; Michael L. Foster, cheese factory at Florence, O.; C. W. Bowman, cheese factory at Axtel, Lorain County, O.; S. A. Postle, cheese factory at Whitefield, Putnam County, Ill.; Christian Graber, cheese factory at Benton, O.

Several prominent dairymen of the state have arranged to have Professor Decker address one or more dairy meetings in their vicinity during this spring. Wednesday, March 28, he will speak at three sessions at Triumph, Ohio, arranged for by C. C. Rice, of that place. The 29th he will speak at Dodgeville. The 3d, 4th and 5th of April the Professor will attend meetings in Columbiana County, arranged for by Messrs. Dillon and Stratton. April 16th he goes to Caleb, Ohio, for an afternoon and evening session. Other lectures will be arranged for later. Professor Decker will lecture on "Milk and Its Care," "How to Select a Good Cow," "Cows That Pay," and other subjects, of either local or general interest. He will carry with him his own stereoptican and an excellent set of views taken in the Dairy School this winter, which illustrate all the various phases



CLASS IN DAIRYING, 1900.

in the manufacture of cheese and butter as performed daily by the students under the eyes of the instructors.

Children's Gardens.

Among the various lines of work taken up by the Students' Union of this state, is that of the children's flower garden. The work was commenced last year under the direction of F. K. Luke, and the reports were very encouraging. About twenty-five little experimenters began work under the direction of Mr. Luke, but only about ten of them made a final report. Packages of flowers and vegetable seed are sent to the children, with instructions as to planting and cultivating, and the director is ready to give any information desired during the entire growing season. The plants are watched as they come up, as they grow and develop leaf and flower and fruit. Finally, after the season is over, the children are requested to make a complete report of the results of the summer's experiment, the same as other experimenters under the direction of the Union.

The plan is surely a very commendable one, and will doubtless do much good. It will help the children to see and appreciate some of the beautiful things all around them, before unnoticed. It is a work, too, in which the parents should be deeply interested, and in which they can do much to make the work successful. Let the parents see that the children have a definite area of ground set off for their garden and assist and direct them in their first efforts, and see that everything is noted, in order that a creditable report may be made. The effect cannot help but be wholesome. The children will become interested in the growth of the plants around them, and will become keen observers of the common but beautiful things so often overlooked. A love for nature and her beauties will begin in this simple work, which will follow and perhaps influence the whole after-life of the child.

This summer Mr. Luke expects to extend the work, as far as the means will permit, and the results will be watched with interest. The following is the form of letter sent out to the children.

DIRECTIONS FOR MAKING THE GARDEN.

See to it that the ground is well plowed or spaded, after which it must be well leveled and pulverized with a rake. Each plant should be marked by putting a stake at the end of the row, with the name of the flower or vegetable on it.

SOWING THE SEED.

For the flower seeds the rows should be two feet apart. Sow the seed in these rows. The rule is to sow the seed about as deep or slightly deeper than the seed is thick. The best way to sow seed as small as that of portulacca, is to make a small mark for the row and then sow the seed on this mark on top of the ground. Then take a smooth flat stick and gently press the seed in the ground. Before such small seed is sown the soil should be finely pulverized. After sowing this small seed it will be well to water it a little to settle the earth around the seed.

I cannot tell you the exact time that you should plant your vegetables, because there is such a difference in the season. A safe time is, I think, corn planting time in your neighborhood.

Beans. Make the rows three feet apart and drop the beans about two inches apart in the row and two to three inches deep.

Beets. Sow the beets in rows that are 12 to 18 inches apart.

Plant the melons from four to six feet apart each way, and the squash about eight feet apart.

Peanuts should be planted one seed in a place about a foot apart and covered two inches deep. Make the rows about three feet apart.

Peppers. Sow the seed in a small box early and then plant them in the garden early in June. Put the young plants 15 inches apart in the row and the rows two to three feet apart.

The flowers, as well as the vegetables, must be well cultivated. By good cultivation I mean not only to keep the weeds down, but also to keep the ground loose.

The real objects of these gardens is to help you see and understand some of the beautiful things on the farm. You must watch the plants when they come up, watch them as they grow, and study the leaves and flowers. I think you will find it very enjoyable work.

Remember, this garden is all yours. You can do with the products just what you like. You must write me occasionally about it, for I will be thinking about you. I want to know how you are getting along. I shall be glad to give you such information as you desire if you will write to me about it.

F. K. LUKE,
Ohio State University.

Introduced Plants of the Ohio Flora.

The introduced or non-indigenous plants of Ohio have for the past few years been under investigation by the Botanical Department. The manuscript for a bulletin on the subject has just been completed and we glean the following facts from the same:

With the advent of civilized man in a new country certain plants new to the region and usually called weeds invariably make their appearance. Very few of them are purposely carried, and generally they gain entrance indirectly. Some plants from the country whence travel began were carried for purposes of food, pasture, clothing, medicine or ornament, and now and then they escaped from cultivation and established themselves as a part of the flora of the new country. But the majority of introduced plants in our flora have gained entrance indirectly. For example, seed of the cultivated cereals is shipped from foreign countries and often weed seeds are contained which give a start to many troublesome plants. The weed may be undetected and undestroyed for a few years and then it is almost impossible to eradicate its progress. Weeds have been steadily flowing to this country since commerce began and the consequence is that we now have about four hundred and eighteen species or kinds that are native of Europe. We have twenty-six species that have come to our country from Asia. Tropical America and South America have furnished about twenty species of our non-indigenous flora. Recently weeds from the western part of our country have been gaining a foothold in Ohio. The list shows fourty-one of such species. For the most part these have come by rail. Cars that carry grain from the west now and then carry western wild plants that prove able to compete with the indigenous plants. Seeds are also carried in hay that is shipped in; sometimes they are in packing used in general shipping of ornamental plants, trees, and apparatus.

An interesting case is furnished by the winter quarters of Sells' Menagerie at Columbus. At this place several plants from the extreme south or eastern portion of our country may each year be seen growing. A southern species of Croton has maintained itstlf for several years, as has also species of Helinium or Sneeze-weed.

The total number of the introduced plants in Professor Kellerman's list is four hundred and eighteen. The State Catalogue contains two thousand and fifty; therefore a little over 20 per cent of the Ohio Flora is not indigenous, but has been introduced. Of the latter one hundred and eighty-seven are annual

plants, thirty-six are biennial, and one hundred and ninety-seven are perennial.

The number of families represented is fifty-one. Of these compositæ, as a matter of course, stands first with fifty-eight species. The following are represented as indicated by the numbers following the names: Gramineæ 7, Cruciferæ 15, Polygonaceæ 14, Rosaceæ 12, Leguminoceæ 12, Umbelliferæ 11, Caryophyllaceæ 8, Chenopodiaceæ 10, Salicaceæ 8, Convolvulaceæ 8, Labiatæ 6, Amarantaceæ 6, Liliaceæ 5, Malvaceæ 5, Solanaceæ 5, Papavuaceæ 5, Ranunculaceæ 5, Boraginaceæ 5, and others with smaller numbers.

The plants in question are further classified as Annuals 187 species, biennials 36 species, and perennials 197 species. These again are grouped as waifs, occasionally escaped, and thoroughly naturalized. The first includes such plants as incidentally get a foothold at a single place and in all probability will have difficulty in permanently maintaining themselves as a part of our flora. Of these the list includes fifty-eight species. Those which occur only occasionally number two hundred and six. While the introduced species that are naturalized beyond question, not to be eradicated from our flora are two hundred and thirteen in number.

An interesting phase of this subject is the comparative number of plants introduced from the old world and from the distant parts of America. Since 1620 people have been coming from the East, and we may say that since 1850 there has been more or less travel from the far western parts of our country. The former period includes twenty-eight decades, and the latter five decades counting to the present time. The ratio of 28 to 5 is about five and one-half to one. The plants introduced from the old world in that time is about three hundred and forty, to seventy-two from distant parts of America. The ratio, in other words, is about four and three-fourths to one. That is, proportionately to the time, a larger introduction of plants to Ohio has occurred from parts of our continent than from the Eastern hemispheres.—Lantern.

Domestic Art.

The rapid progress which the Department of Domestic Art has made under the efficient supervision of Miss Souther is strikingly apparent to all who have observed its work from the beginning.

Although a lecture goes a long way toward enlightening one on the subject with which it deals, it is quite evident that it does not accomplish much as an illustration of the subject. Realizing this, Miss Souther, with untiring perseverance, has succeeded in collecting for this department many fine specimens, illustrating the evolution of industry and art in so far as the latter are connected with the home and the people, and concerned with their comfort and adornment.

The care and discrimination necessary in collecting and arranging material for the illustration of this work are happily combined in the person of Miss Souther. Possessed of an inate love of the beautiful, and a keen appreciation of its influence on all the phases of life, she has gathered together a collection which is well worthy of mention. Among the treasures one finds copies of famous paintings, delineating the costumes and fashion. of historic times; and miniature casts of the world's famous sculpture, illustrating the beauty of form and figure. A splendid collection of books of reference on subjects pertaining to this department is to be found in the University Library, and it is being gradually reinforced by additional volumes as they are obtainable.

The lecture courses are of great interest, as well as of much value. They com-

prise an exposition of the effect of primitive and ancient industrial life upon the artistic and industrial evolution of society. The various processes of manufacturing fabrics from fibers and wools and their influence upon the industrial activities of the world are studied; also the sources of the different fibers and the particular fabrics into which they are converted.

The silk worm, its growth, treatment and use, is one of the most interesting, because the most wonderful of subjects in this series. Hygienic and artistic dress, with attention to and consideration of line, form and color, are also reviewed in connection with the choice and the treatment of textiles. Art applied to dress and home decoration, and the history of domestic art and architecture complete the range of topics covered in the lectures. A glance over the list suffices to convince one of the great value and the practical information to be had from such a course.

Miss Souther, who has so ably developed this department to its present excellent condition, was graduated at the Marys' Institute (Washington University), at St. Louis, Mo., in 1883. She remained there studying as a graduate student until 1885. Later she studied at Pratt Institute, Brooklyn. During 1896-97 she was Instructor of Manual Training in the Carola-Vereius Seminary at Leipsic, and remained abroad, studying the domestic art methods in foreign cities, until 1898, when she returned to accept a position as teacher of sewing in Mrs. Ball's Private School, of St. Louis. Her present position, as Assistant Professor of Domestic Art of O. S. U., she has held since February, 1899.

M. F. H.

Humus as a Soil Constituent.

Humus is universally conceded to be a valuable constituent of soils, but the extent of its effects on the fertility are seldom realized. Humus is derived from animal and vegetable matter which has been acted upon by the various microorganisms of the soil and is in a state of more or less complete decomposition. It originally consisted of the same compounds as cellulose, proteid or nitrogenous bodies, and organic acids, that are found in plants and animals. By successive changes they have been reduced to a dark colored material of varying composition, depending on the the source from which it was derived, whether mainly cellulose or a mixture of nitrogenous materials and other organic bodies.

Generally speaking, the effects of humus on the soil, in producing plant growth, may be divided into two classes: First, the mechanical, and second, the chemical.

Studying first the mechanical effects, we find their presence improves the mechanical condition of the soil. Its low specific gravity as compared with inorganic material, renders the soil lighter and more easily worked, which is an important factor in the economy of labor. The structure of humus is more open than that of the disintegrated material making up the bulk of most soils, giving a greater porosity, and hence an increased freedom of air circulation, which is essential to the life of many of the microorganisms found in it. Air is also required by the roots of plants, and its absence results in their death. This is commonly illustrated in water-logged soils; that is, those saturated with moisture. Besides increasing the air space, the water holding power is greatly augmented; the organic material serving as a sponge to store up the moisture falling as rain, and giving it out to the plant

rootlets as needed. The water supply is very often the determining element in deciding the productivity of soils, being essential to the operation of nearly all the other factors of plant growth.

Though air, water and available food are required, the energizing factor is heat, and its source is the sun. The building up of organic compounds is a process of storing up heat, while their destruction, whether by fire or the more slow process of decomposition, results in its liberation. The dark color of humus is due to the presence of carbon, and, following a well-known law of physics, has a great power of absorbing heat. Thus it is that a dark colored soil will be warmed sufficient for plant production much more quickly than one of the lighter color. Heat quickens all the activities of the soil, and the result is that it may be worked earlier in the spring, when time is most valued, and a few days count for so much.

From the standpoint of the chemical effects, it is very obvious that since it is derived from organic matter, humus is rich in plant food, being almost a balanced ration, if we may be allowed to use the term. But aside from being a source of plant food, various acids are formed, whose action upon the inorganic and water-insoluble elements of the soil is very valuable. By the action of these acids, as well as the micro-organisms that feed upon humus derivitives, these native elements of the soil are united in compounds that may be utilized as plant food. The process by which these changes are brought about is a complex one, requiring a thorough study of the chemical and physical properties of the soil. However, the knowledge that such changes occur, is sufficient for a working basis, while an understanding of the fundamental actions of humus are essential to the successful manipulation of the soil.

E. O. F.

Principles of Cream Ripening.

The all-important question of the day with creamery and dairy men is how to obtain a uniform and fine flavored butter.

Nearly all investigators argee that the secret lies in the proper ripening of the cream, and when we read of the tons of low-grade butter brought into the markets daily, due to the fact that negligence or ignorance as to the proper treatment of cream lies at the root of this great fault, it appears to be a point worthy of careful consideration.

The ripening of cream includes two features upon which the quality of butter largely depends; their flavor and texture.

The effects of ripening are far more marked upon the flavor of the butter than upon texture, for it is during this process that the characteristic flavors are developed.

Cream ripening is merely a fermentation process, caused by bacterial growth. This growth is controlled by temperature, in which a rise (from 60° F., and not to exceed 100° F.), induces growth and develops immense numbers of bacteria, while the lowering of the stated temperature retards growth. The action of these germs in cream results in the conversion of a part of the milk sugar into lactic acid, a slight formation of carbonic acid gas and a few other volatile constituents not definitely known. The production of lactic acid causes the sourness of cream and is largely accountable for the desired flavor in butter. It is the most important product formed and serves as a guide in testing the ripeness of cream. The carbonic acid gas is mostly given off, but the volatile constituents play an important part, if fermentation is properly carried on, in producing a fine aroma, not obtained by the addition of foreign acids with the hope of securing

the same flavor without ripening. Sweet cream butter has very little flavor, and it is only through the ripening or souring of cream that the flavor of butter is obtained. The ripening of cream may develop good or bad flavors, depending upon the kind of bacteria which causes the fermentation of the cream.

A particular kind of bacteria, as a rule, gives rise to a fermentation characteristic of that specie, consequently the undesirable fermentation is always due to some undesirable germ. The source of these undesirable germs in milk is filth, brought about by careless and dirty milking, or by the use of unclean utensils, and sometimes by the use of milk from a diseased cow. Much stress should be laid on cleanliness in every phase of milk and butter production. Filthiness is the great source of trouble in the art of butter making.

Besides bad fermentation, there is another cause of "off flavored" butter. This comes from cream or milk being exposed to foul odors, which are absorbed and contributed to the butter. The theory that milk does not absorb odors when warm and cooling has long since been abandoned, for experiments show that milk in that condition is even more susceptible to absorbing odors than in any other.

In the ripening process this odor can be partly eliminated by aeration or pasteurization of the cream, but in case of a bad fermentation, some antagonistic germ must be added in order to check the progress of the undesirable one.

This antagonistic fermentation is commonly known as a starter, and if properly prepared contains the right kind of flavor-producing bacteria. The preparation of a starter is as follows: Select three or four pint jars of the best milk that comes to the creamery, or, where opportunity affords, select the milk from several good cows; cover these jars and set them away in a warm place until the milk has coagulated. From these select the one that has developed the best sharp acid taste, free from disagreeable odors and gas bubbles, and shows a solid curd. A can of skim milk should then be heated to a temperature not exceeding 157° F. for twenty minutes, and cooled to 75° or 80° F. The selected jar of milk is then added, and after thoroughly mixing it, set the can in a place where the temperature can be kept at 75° or 80° F. for twenty-four hours. A wooden tank large enough to hold seven or eight times the volume of the starter, and as high as the starter cans, answers the purpose well for keeping the starter at a uniform temperature for a long time. The entire amount of the starter should be sour at the end of this period and apparently of the same flavor as that of the original selected jar of milk. The starter is now ready for use, and an amount equal to seven or eight per cent. of the cream to be prepared is added. It can be perpetuated by adding one or two quarts daily to fresh pasteurized milk, to the extent of eight or ten days, depending on the cleanliness and the care taken in pasteurizing the skim milk.

This method for perpetuating a starter generally brings the best result. There are, however, some prepared cultures on the market which are equally as good, but more expensive. Simple methods for preparing starters are often proposed, such as leaving some sour cream in the vat and run the fresh cream with it, or by adding buttermilk to the cream, but they cannot be recommended, as they too often fail in producing the desired flavor. A starter must not only be considered as a means for improving the flavor of tainted cream, but ought to be universally adopted as a means for ripening all cream. A good starter lays the foundation for fine and uniform flavored butter, and without it a fine flavor could not be

obtained in making pasteurized butter. The reputation attributed to the Danish people for making uniform butter that has gained preference in the English and other foreign markets, is largely, if not entirely, due to the use of starters in the manufacture of their butter.

In ripening cream care must be taken to reach the right degree of acidity. This can be determined with Mann's Acid Test or with Farrington alkaline tablets. If the ripening is carried on too far, the bacteria are liable to attack the albumen or the fat of the cream, forming a new product which will give butter a disagreeable flavor. The over-ripening of cream also affects the keeping quality of butter to a large extent. An experiment will probably best illustrate this point.

Two samples of butter were analyzed. In the first sample the butter churned from over ripe cream contained 1.16 per cent. of casein, while in the second sample, butter being churned from mildly ripened cream contained only 0.80 per cent. As the keeping quality of butter depends larely on the amount of casein it contains, it will be readily seen that under equal conditions the over ripe sample would become "off flavored" more rapidly than the other.

To produce a uniform flavor in butter, the degree of acidity must be considered in relation to the thickness of the cream. In the making of a high flavored butter, the cream must be thin, rather than thick, in order to furnish more milk serum for the development of more acid. Thick cream should not be ripened to so high a degree of acidity as thin cream, for the reason that the flavor of the butter is endangered on account of lack of food supply for germ growth for the production of more acid. The following standard has been adopted by many buttermakers as a guide. For cream containing 20 per cent. of butter fat, it should be ripened so as to develop about 0.67 of one per cent. of acid, as determined by means of Farrington's tablets, and to every 10 per cent. increase of fat there should be a decrease of one-tenth of one per cent. of acid, as the proper stage for checking the fermentation.

A certain temperature for ripening cream seems to have little effect on the flavor, providing the cream is ripened above 60° and below 90°. The ripening is, however, much hastened by high temperature. A satisfactory temperature is from 65 to 70 for summer, and from 70 to 80 for winter. The cream should be stirred occasionally during the ripening process. This is essential for several reasons; it aerates the cream, insures evenness in ripening, prevents the top surface from drying, which is one of the causes of mottled butter, and furnishes free oxygen to the germs, which seem to play a part in the ripening process. The texture of butter is largely controlled by temperatures, and care must be taken after the flavor has developed that the cream should be cooled down a few hours before churning. About 48° F. for rich cream and 56° F. for thin cream has proven to be satisfactory for the average conditions. This, however, depends somewhat on the temperature of the churn room.

OSCAR ERF.

Shorthorn Cattle.

The various breeds of cattle which are found in this country at the present time may be quite broadly classified into the dairy type or the beef type, depending upon the function of the breed. A third division may be made, the dual purpose type, about the existence of which there is much dispute and confusion at the present time.

As examples of the beef type, we may cite the Hereford, Aberdeen, Angus and Galloway, and many would insist upon the Shorthorn. As the majority of shorthorns are bred today in the United States,

they very properly belong to the beef type, and when bred with this purpose in view, they rank second to none in converting grain and forage into good, wholesome beef at a handsome profit over the cost of production.

Of the dairy type, we have the Jerseys, Guernseys, Holsteins, Ayrshires and others of lesser importance.

Now, there is a class of cattle which cannot properly be classified in either of the foregoing divisions, and hence the necessity of a dual purpose classification to which belong the Devons, Red Polled, Polled Durham and a very large proportion of the Shorthorns, as bred in England, as well as many large herds in our own couitry. In fact, the Shorthorns, as a breed, are generally placed in this general purpose classification.

As to the early history of this breed, we know very little. They originated in the valley of the River Tees, in the countries of York and Durham, in northeastern England. The early conquerors of England, the Romans, Saxons, Danes and Normans, brought with them cattle from their native countries and their cattle soon became disseminated throughout the island, and their blood mingled with that of the native cattle. There is a traditional story to the effect that early in the history of the breed there was introduced from Holland a bull and some cows, and that the blood of this importation, assisted by later importations of the same stock, aided in the improvement of the native Teeswater cattle, as they were then called, but later investigations by reliable authorities seem to discredit this theory. The breed first came into prominence by the efforts of two very shrewd business men and foremost improvers of the breed, the brothers, Robert and Charles Collins. There were other earlier and contemporaneous breeders, such as Millbank, Stevenson, Maynard and Wetherell, and no doubt the Collins brothers were deeply indebted to these pioneer breeders for the great excellence of the cattle which they brought into such prominent notice about the year 1780. After the dispersion of their herds in 1810, the work was continued by the Booths, Thomas Bates, and still later Lord Ducie and Amos Cruikshank.

The Booth branch of the Shorthorn family was bred with a view to beef production rather than milk, although many of the cows were good milkers, and many of them were able to give proper nourishment for their calves. They were large, had great depth and heart girth and had a depth and mellowness of flesh not characteristic of the Bates Shorthorn to which I shall refer later. They lacked the clear cut head and neck and graceful carriage which will be noted in their Bates cousins.

Mr. Thomas Bates began his breeding operations during the latter part of the last century and continued them until his death in 1849. He was one of those breeders who was always anxious to retain and breed the good milking qualities of his cattle. Animals of his breeding had good size and were noted for their symmetrical form and stylish carriage. Lord Ducie also sought to stimulate the milking qualities of his cattle and in this respect followed in the footsteps of Thomas Bates, from whom he purchased many valuable animals.

Amos Cruikshank selected for his foundation, animals of mixed Bates and Booth breeding. He continued to breed until 1889. Many of his cattle found their way into the herds of such skillful breeders as William Duthie and W. S. Marr, of Aberdeenshire, Scotland, who have done much to bring into prominence the compact, short-legged, blocky Scotch Shorthorns that are such prime favorites with our present Shorthorn breeders.

The first importation into America was made about 1797, or perhaps a little earlier. From that date on importations were made at irregular intervals until 1834, when a number of Scioto valley farmers organized a company and imported a great many valuable animals, from which have sprung such famous American strains as the Rose of Sharons Young Marys, Matildas, Young Phyllis, Airdries, Dukes and many others. Kentucky soon followed in the wake of Ohio, and the importations of Shorthorns have continued almost unabated until the present day. Among some of the earlier breeders of Ohio were the Renicks, the Millers, Governor Trimble and others.

In Kentucky, A. J. and R. A. Alexander, William Warfield, the Bedfords and Abraham Renick have added volumes to the history of the breed in America. The great usefulness of the Shorthorns in this country has not been so much in their value as pure bred animals as in the wonderful prepotency of the breed, which has enabled them to improve the native cattle of the country. No other breed has such power to transmit its desirable characteristics to indifferent stock as the Shorthorn. I do not believe that the farmers of Ohio can find a better class of cattle to put on their farms as a dual purpose animal than the Shorthorn, or its late offspring, the Polled Durham.

I do not believe that the majority of farmers in Ohio are willing to keep the so-called special purpose dairy cattle. What we need is a class of cattle that will give a fair profit in milk and butter fat for food consumed and at the same time produce steers that can be fed into profitable animals such as our markets demand. Records of 10,000 to 12,000 pounds of milk per year are not unknown to Shorthorn cows. The quality of the milk is above the average. The fat globules are of medium size and very uniform, thus insuring a clean separation of cream. The grand success of the Shorthorn herd of twenty-five cows which entered the great dairy test at the Columbian Exposition in Chicago in 1893, stamped Shorthorns as dangerous competitors to the special dairy breeds when bred for milk and butter production. If the value of the progeny be taken into account, then the dairy Shorthorn is pre-eminently the most profitable cow for the Ohio dairyman to breed.

In competitive tests of dairy breeds, made by the Experiment Stations of Maine, New York and New Jersey, the following breeds were tested: Aryshire, Devon, Guernsey, Jersey, Holstein and Shorthorn. The results were as follows: The Shorthorn ranked first in the quantity of milk produced, with the Holstein second and Ayrshire third. In the production of butter fat, the Shorthorn ranked first, leading the second ranking breed, Guernseys, by 22.5 pounds. In the Sixteenth Annual Report of the Wisconsin Experiment Station, we find the dairy herd record for the past year. It is a significant fact that a Shorthorn cow stands at the head of the herd, she having produced more milk and butter fat at a less cost for feed and making a greater net profit than any of the Jerseys or Guernseys in the test.

British dairy farms have a much larger proportion of dairy Shorthorn herds than we have in the United States, and recent reports of Yearly Dairy Records in British Farm Papers show conclusively that in England the dairy Shorthorn has clearly established their superiority over all other breeds. Of course, the Englishman has paid more attention to the development of milk and butter production than his American cousin, but the enviable results attained by English breeders may serve as an index to what the American dairyman, and especially the Ohio dairyman, can accomplish by careful selection and good judgment in the choice of breeding stock.

C. B. S.

Hydrophobia.

As we have had many cases of rabies at the Veterinary Department during the year, and received many inquiries about the disease, a few facts in regard to the disease may be of interest to our readers. Rabies, or hydrophobia, is strictly a contagious disease, and is only spread by the bite of a rabid animal. The disease never originates spontaneously during hot weather, as many people imagine. In fact, it seems more prevalent during the winter months. The disease is rarely spread by the bite of any other animal than the dog, largely for the reason that a dog's natural method of attack is by biting. The time which elapses from the bite of a rabid dog to the manifestation of the first symptom is from three weeks to three months, never exceeding this period. No animal is exempt from the disease, but not all animals bitten are affected by it. The per cent. of animals bitten by rabid dogs, which ultimately develop the disease, is estimated from 20 to 60 per cent. In man the per cent. is about 50. The exact germ of rabies is as yet unknown, but the specific agent, whatever it may be, is found in the saliva, brain and cord, and some of the glandular organs of the body. This has been determined by inoculation of other animals with these substances. Inoculation with brain substance which had undergone decomposition, produced the disease, showing the virus to be very resistent. The blood does not contain the virus. A recovery has never been noted after the first symptoms have been shown, except in the inoculation experiments made by Pasteur. We recognize two forms of the disease in the dog, known as the mute and raging forms. The only difference is in the symptoms shown. If the brain is more affected, the raging form is shown; if the cord is affected, the dumb or paralytic form appears. In the raging form we recognize three stages, with symptoms in typical cases as follows:

First, or melancholia stage—The habits of the dog become changed, his disposition is altered, he is easily irritated and seems depressed, the countenance is haggard and vacant, food and water are refused and the dog shows a great tendency to gnaw indigestible articles and bits of wood, grass, etc.

The second, or raging stage, usually follows the first stage in a day or so. The dog shows a great desire to run away from home, and will wander off in an aimless way, covering great distances, but if not killed or too exhausted, may return home. During this time he shows a tendency to bite animals or men coming in his way, he does not run at full speed, making furious attacks as popularly supposed, but snaps once or twice at animals in his reach and then goes on about his business. These biting spells seem to occur during a delirium, which lasts for a time only, as the animal often appears rational at intervals. As the disease progresses the delirium increases and the dog bites at imaginary objects as if he were snapping at flies. The voice changes, being a peculiar raw wailing bark, which is very characteristic, and once heard will always be remembered. The dog does not fear water, and will swim streams while wandering about, but as the throat is paralysed, the animal is unable to swallow. The animal rapidly emaciates and grows weaker during this stage, which lasts a few days, when the third, or paralytic stage, ensues, the lower jaw becomes paralyzed and hangs helplessly, with saliva dripping and tongue hanging out of mouth, and the animal becomes reduced to a skeleton, with eyes sunken deep into sockets. The hind extremities become paralyzed, the dog is unable to rise, and dies from exhaustion in from five to ten days after showing the first symptoms.

The dumb form differs from the raging only in that the second stage is absent and the course is usually shorter. The reader should bear in mind that the symptoms as given are of a typical case, and not every dog shows exactly the same symptoms. Often it is hard to distinguish the different stages, as they come on gradually, no sharp line being drawn between them, like the different acts of a play. We have had a good many cases of both forms at the Veterinary Department, and we had an excellent opportunity to study the disease. We have noted some peculiarities in regard to it. The affected dogs rarely show any inclination to bite their masters. Several dogs suffering from rabies have been brought to the hospital by the owners, toward whom they were docile and obedient, but would snap furiously at strangers who came near them. The rabid dog shows a great desire to attack animals toward which he has a natural dislike, as cattle, sheep and strange dogs. This was well shown in the cases of cattle reported last fall in THE STUDENT, where the farm dog would bite the cattle at every opportunity, but not molesting the horses or children. There is perhaps no other animal disease which is less understood by the laymen. It is never recognized by them, while any disease having symptoms of cerebral excitement or even spasms from strychnine are promptly diagnosed as hydrophobia and the treatment, a gun or an ax, prescribed at once. A rabid dog differs from all other sick dogs in the fact that he is very restless, ever on the move, and that his habits and disposition are totally changed. A dog sick from other causes is inclined to be dull, not easily moved; he seeks cool places and lies quietly and shows no desire to run about. If a dog suspected of rabies bites animals or men he should never be killed, but should be confined and offered food and drink. If he is really suffering from rabies these will be refused and the animal will rapidly emaciate and die in a few days. The diagnosis can be positively affirmed or decided by the intra-cranial inoculation of rabbits, and where a diagnosis is in doubt, the head of suspected animals should be sent to veterinarians, physicians or institutions capable of carying this out successfully. Rabies has been successfully combated in man by the Pasteur treatment, which consists of inoculation of a weakened virus, creating an immunity in the individual thus treated. Several people bitten by the Sagstetter dog were thus treated and have as yet shown no symptoms, and as the usual period of inoculation has elapsed, the treatment was evidently entirely successful. The application of alleged madstones, etc., is merely superstition, and all cures supposed to have been accomplished have been the result of mistaken diagnosis of rabies or the natural immunity of the individual.

C. W. Eddy.

Effect of Freezing on Fruit Trees.

The Weather Bureau at Columbus has received many letters from prominent horticulturists of the state in reply to a circular letter inquiring about the damage done to fruit trees by cold during the winter of 1898-99. From the data obtained, we find that much damage was done to the peach, pear and plum.

The peach crop was nearly a total failure in all parts of the state, except along the lake. Pears and plums were partial failures. The trees were greatly injured by the cold, in some localities being killed root and branch. In localities where snow was on the ground the tops only were severely frozen, while in water-logged and wind-exposed places the roots were killed. The damage was greatest also on rich, loamy and clay soils; in valleys and on late cultivated and bare

ground. The northwestern part of the state had no snow on the ground at the time of the cold wave in February, and from that region all the letters indicate that the trees were hurt mostly at the roots. In other parts, where there was snow, the buds and branches were frozen and in some instances young trees were frozen at the surface of the snow by contact. Professor Selby, of the Experiment Station, says that in the peach orchard of Mr. Miller, on the Peninsula of Gypsuna, those trees that were injured or killed had a basin-shaped depression in the ground at the foot of the tree. In this case the trunks were frozen by contact, if freezing was coincident with a supply of water.

The reports indicate that the apple trees did not suffer much injury from the cold. In most localities the crops were none the best, but in nearly all cases a cause was assigned for the failure. Principal among these were: The drought during the summer; cold rains at the time of blossoming, and the work of insects.

Nearly all report that there were plenty of live fruit buds on the peach up to February, and with the exception of three, all replies lay the cause to the extreme and continued cold weather of February.

According to Professor McDougal, the death of a plant may be due either to the direct action of the cold or to the consequent drying of the tissues. The cell contains a large amount of water in the protoplasm and in the cell wall. Now, when the cells are subjected to a low temperature, they contract, a portion of the water is drawn out into the intercellular spaces where it is frozen. If the temperature is lowered further, more water is drawn out and this may continue until all the water has been drawn out of the cell and frozen, and when this is carried far enough the ice will split the cells apart, as is the case in the splitting of trees. This power of protoplasm to excrete the water is a protective measure to prevent formation of ice crystals within the cells. The protoplasm of the different cells of a plant and of different species possesses this power, but in different degrees, as some are capable of withstanding lower temperature than others.

But if the protoplasm is unable to excrete enough water to prevent its freezing, the ice crystals will cause a disintegration of the protoplasm, and death will follow, and as Molisch found, regardless of the after-treatment given the plant. There has been much discussion as to whether death is due to the freezing or to the thawing. It is claimed that if a frozen plant be thawed slowly, so that the cell can take back the water, it will be able to readjust itself, and will live, while if the thawing had taken place rapidly the plant would not have been able to recover. This Molisch and others found was not true, for in all experiments of rapid and slow thawing the slow thawing did not restore activity.

If the temperature is not low enough to cause ice formation in the cells, but is prolonged for some time, then death will be caused by a dessication of the tissues. For example, in the case of roots of a tree on bare, wet ground being frozen and a dry wind is blowing, or it is sunny, the transpiration from the limbs is in excess of that which the roots can absorb, and consequently death will ensue from the drying of the tissues. This can be prevented to some extent by under-drainage, if soil is wet, and by a mulch to prevent ground being frozen to such a depth that the roots are in frozen ground.

The injury to a tree by low temperatures will depend upon the stage of activity in which the cells are in at the time. Hence any treatment which hastens the maturity of the wood in the fall so as to put the cells in a dormant condition be-

fore cold weather prevails will decrease the chances of damage to the minimum.

Draining the soil and a dry autumn favors wood maturity, while a dry summer followed by a wet autumn and late cultivation stimulate the growth and thereby increase the chances of injury.

C. N. M.

Birds of Economic Value.

The family Falconidæ, the diurnal birds of prey, constitute a very interesting and important group of birds. They have the same relation to other birds that the carnivora have to other mammals, and, according to the nature of their food, they may be classed either as beneficial, neutral, or harmful to the interests of man.

Considering the family in regular order, the Kites are placed first. The Swallow-tailed Kite, the largest of the Kites ,much resembles a swallow in its forked-tail and graceful flight. It catches its prey, eats it, and drinks while flying. Its food consists of snakes, lizards, grasshoppers, and other insects, and it is a very beneficial species. It was, prior to about 1840, quite common in Ohio, but for some reason has since been very rare. It is yet common in the Southwestern States and in Mexico. The White-tailed Kite and the Mississippi Kite are never seen as far north as Ohio. They are beneficial and much resemble the preceding species in food habits. The Everglade Kite lives on the snails of the Florida Everglades, and is locally known as the "Snail Hawk."

Considering next the Hawks, we have first the Marsh Hawk. This bird inhabits the whole of North America. It is quite common in some parts of Ohio. It is one of the most beneficial of hawks, and secures its food by flying over marsh or meadow, quite close to the ground, thus surprising and capturing its prey at close quarters. It rarely molests poultry, but lives on mice, reptiles and insects. This Hawk is of good size and can be recognized by the white banded rump, which mark shows quite plainly during the flight of the bird. The nest is built on the groud in marshes.

The Sharp-shinned Hawk is a very daring enemy of birds, generally; even those of larger size often being attacked. It is very fond of young chickens, and will usually stay near until the supply is exhausted. Of late, however, it seems to have discovered that English sparrows are very good eating and easy to obtain. They now often frequent city parks during the winter. This species has a square tail while Cooper's Hawk has a rounded tail.

Cooper's Hawk much resembles the preceding species in food habits and in color markings, but is larger. It is smaller, however, than the following species and is also lighter in color. It is quite common in Ohio.

The American Goshawk is of greater size than the two preceding hawks, but like them is very destructive to birds and poultry. Luckily, the breeding place is so far north that it is only a rare winter visitant in Ohio.

Harris's Hawk is a beneficial species found only in the southern limits of the United States.

The Red-tailed Hawk is one of the commonest of hawks to Ohio. It is a soaring hawk and can be distinguished from the Red-shouldered Hawk by the indistinct barring of the tail. The bars show plainly in the latter species. The tail is a bright chestnut-red in color. It is a beneficial hawk—85 per cent. of its food being mice, reptiles, etc., injurious to the interests of man.

The Red-shouldered Hawk is slightly smaller in size, but is much like the Red-tailed Hawk in habit. It is darker colored and has a barred tail. Very little poultry is taken by either this or the pre-

The Zone-tailed Hawk occurs in Western United States, and is probably neutral in food habits.

Swainson's Hawk is a beneficial species of Western United States, occurring rarely east of the Mississippi. It is very fond of grasshoppers and only seldom molests birds.

[To Be Continued.]

Book Reviews.

"North American Forests and Forestry," by Ernest Bruncken. Cloth; pp. 265. G. P. Putnam's Sons, New York. Price $2.00.

The subject of forestry is one that, within the past few years, has been engaging the attention of many of the leading minds of this country, and is destined to soon come to the front as one of the great domestic questions demanding solution by the government. In this country legislation depends on public opinion, and public opinion must be created and instructed. This the author gives as the most important reason why this book exists.

Mr. Bruncken was Secretary of the late Wisconsin State Forestry Commission, and is thoroughly conversant on the subject, not only from the standpoint of a practical forester, but also as one realizing the extent to which the subject is woven into our whole social and economic life.

The author outlines the character of the American forest in the various sections of the continent; the part it plays in the economic and social life of the nation; its history as determined by the forces of nature and modified by the activities of man. He clears away the ordinary misconceptions of forestry and shows that the forests are necessary as great regulators of meteorological phenomena, and climatic conditions. It is further shown, howver, that to do this it is not necessary to refrain from utilizing the products of the forest, but that wise treatment will give use more of these products, and at the same time leave the supply permanently assured.

The book is remarkably free from technical terms and was written for those whom the subject interests from an economic and social standpoint rather than for the practical forester. It is most interesting reading from cover to cover and should be found in the library of every one interested in the future welfare of the country.

"Plant Structures," by John M. Coulter. Cloth; pp. 348. D. Appleton & Co., New York. Price $1.50.

This book is similar to Plant Relations by the same author, with the exception that it treats of plants from the morphological standpoint, while the former one approached the subject from an ecological standpoint.

The book is intended for reading and study in connection with laboratory work, and will be found to be of great help to teachers and pupils. The use of technical terms has been omitted whereever possible, but where necessary they have been carefully defined and their derivation and synonyms given. Chapters I-XII, present the general story of the evolution of plants from the lowest to the highest form. Chapter XIII treats of flowers, the most conspicuous of the higher plants, followed by a chapter on the great Angiosperm families, so conspicuous in every flora. Chapter XV deals with anatomical structures of plants. Chapters XVI and XVII give a general view of plants, treating of physiology and ecology in a general way, bringing together the main facts and calling attention to the larger fields. The book is especially well supplied with clear and well described illustrations, adding much to its value as a text or as a book of reference.